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ABSTRACT

This paper presents findings of a study that examined the influence of organizational and instructional factors on the efficacy of cooperative learning in Dutch classrooms, as measured by student achievement. To answer the question "What is the degree to which primary schools in the Netherlands use cooperative learning," a questionnaire was completed by 500 teachers from 750 schools. The second phase involved classroom observation of 1,200 students aged 10-12 years in 55 classrooms in 33 schools, a survey of their teachers, and analysis of student achievement test scores. Findings indicate that there was no difference in the mean quality of cooperation and the mean learning progress in classrooms that used cooperative learning frequently and those that did not. Therefore, no clear conclusions about which organizational and instructional factors affect the efficacy of cooperative learning could be drawn. A research design for more indepth study is highlighted. Four tables are included. (LMI)

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Organizational and instructional factors and the efficacy of cooperative learning in Dutch classroom practice

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Introduction

The study presented here goes into the influence of organizational and instructional factors on the efficacy of cooperative learning (in terms of effects on student achievement) in Dutch classroom practice.

There has been much experimental research into the effects of cooperative learning on student achievement. Most American researchers found positive effects of cooperative learning methods in comparison with individual teaching methods. In the Netherlands, however, experimental research by Vedder and recently by Wiersema indicated that in the schools where cooperative learning had been implemented no better achievements were found. One reason they gave for this poor result is that, although the pupils were asked to cooperate, hardly any subject-oriented talk between the pupils was noticed in these studies. The pupils did not discuss their task or explain things to each other. Vedder suggested that more experience in cooperating is necessary for pupils to learn how to cooperate.

In this study we are interested in the way in which cooperative learning is used in normal Dutch classroom practice in primary schools. The following research questions were asked:

1. To which degree do schools use cooperative learning as a teaching method?

Then we only took schools that use cooperative learning frequently. In these schools we expect pupils to have much experience with cooperative learning.

2. How do the teachers of these schools use cooperative learning? Because we want to know which method of cooperative learning they use and how they compose the groups.
3. What is the influence of these organizational factors and instructional factors on the quality of the cooperation between pupils and on the progress in achievement?

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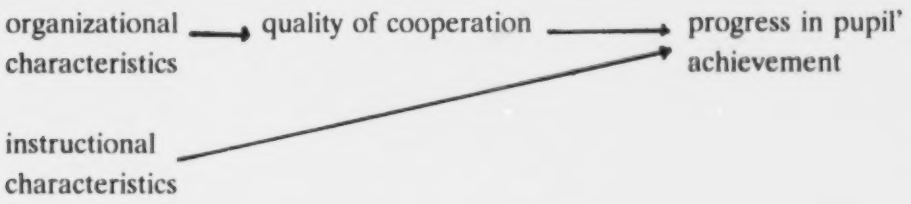
For the third question the expected relations can be modelled as follows:



The quality of cooperation is assumed to be influenced by the organization of cooperative learning. Organizational characteristics may only affect learning progress of the pupils on the condition that the pupils cooperate well.

Organizational factors that may influence the efficacy of cooperative learning are the method of cooperative learning used by the teacher and the group composition. Experimental research indicates that methods in which pupils work together on a task to reach one outcome, but in which they are also individually responsible for a part of this outcome have the most positive effects on achievement. Studies into the effects of group composition suggest that small, fairly heterogeneous, rather stable groups cooperate best.

In the literature on effective schools other instructional factors, besides cooperative learning, seem to have an effect on pupil' achievement. No systematic research has been carried out into the relation between cooperative learning and these instructional factors. However, it might be possible that only teachers who control the whole classroom situation and who are focussed primarily on learning achievements can profit from the advantages of cooperative learning, because they succeed in avoiding process losses during cooperative learning (for example caused by off-task behaviour).

There are different perspectives on the role of cooperation between pupils, with respect to the efficacy of cooperative learning. One perspective focuses on the motivation of pupils to learn. The pupils in a group feel responsible for the achievements and well- being of other pupils in the group and they may stimulate each other to work hard.
The other perspective is oriented towards processes of cognitive change. Pupils will reach higher order thinking levels, if they are confronted with the learning strategies and solutions of other pupils. Based on these perspectives high quality cooperation will be understood in this study as processes in which pupils are (equally) concerned with the task and discuss each others arguments and opinions in a constructive way. A high quality cooperation between pupils will also be characterized by an open, stimulating friendly climate.

To answer the first research question 'To which degree do primary schools use cooperative learning?' we sent teachers of 750 schools a short questionnaire. About 500 teachers reacted. The results are presented in table 1.

Table 1. Percentage of teachers that (frequently) use cooperative learning teaching methods

	arithmetic	language	science
pupils work in groups	6%	7%	30%
pupils produce together 1 product (solution, paper)	2%	3%	21%
pupils discuss in groups	6%	10%	24%
pupils are allowed to help each other	35%	26%	61%

The percentages show that only a few teachers let the pupils work together at one task during arithmetic and language. Helping each other is allowed by 35% of the teachers during aarithmetic and by 26% of the teachers by language. During science cooperative learning methods are more often used. It can be concluded that most of the primary schools only use cooperative learning occasionally. Just a few schools use cooperative learning frequently. The latter schools were asked to participate in the second part of this study.

In the second part of this study 1200 pupils (aged 10 to 12), in 55 classrooms in 33 schools in which cooperative learning is frequently used, participated. The teachers filled in a questionnaire about the organization of cooperative learning: for instance which teaching methods are in use and are the learning groups composed. Besides the information of teachers about the organization of cooperative learning, information was gathered about their instructional behaviour. Standard scales were used, for example for classroom management, for giving feedback, achievement orientation, setting and use of a regular testing system. The pupils made standardized achievement tests of arithmetic, language and science in the beginning and at the end of the schoolyear. For these subjects the achievement progress in this period is calculated. Besides, we got information about other pupil characteristics that may influence their achievements like intelligence.

With respect to the quality of the cooperation between pupils all learning groups were observed during the performance of a standardized consensus task: pupils had to make some decisions and therefore they had to reach consensus about some topics. For these observations an observation instrument for assessing the quality of the cooperation was constructed. This instrument consists of 7 dimensions of cooperation based on the two mentioned perspectives.

1. Involvement of all pupils in the task.
2. Argumentation: the degree to which pupils generate and discuss ideas.
3. Division of work: the degree to which pupils divide their tasks.
4. Listening: the degree to which pupils listen to each other and absorb each other's ideas.
5. Stimulation: the degree to which pupils stimulate each other to carry out their work well and to give their opinions.
6. Climate: the degree to which pupils behave in a relaxed manner and express their feelings and opinions.
7. Decision making: the degree to which the decision making process is democratic.

Inter-observer reliability analyses showed that with this instrument reliable measures were obtained of the quality of cooperation between pupils during the performance of this task.

In order to answer the second research question data on the organization of cooperative learning will be presented. In table 2 the percentage of time teachers spent on the different teaching methods are given.

Table 2. Percentage of time teachers spent on the cooperative learning teaching methods

	arithmetic language	science
- pupils work together at one task, producing one product	10%	19%
- pupils work together at the same task but will produce different products	18%	25%
- pupils work individually but are allowed to help each other	23%	19%
total	51%	63%

With respect to the teaching methods used, three kinds of cooperative learning methods were considered. The teachers spent for arithmetic and language about 10% of the time on the method in which pupils work together at one task, getting one product (a solution, a paper, etc.), 18% of the time on the method in which the pupils work together at the same task but will produce different products and 23% of the time on the method in which the pupils work individually but are allowed to ask each other for help. One can argue about calling this method cooperative learning. I won't do that. In this study this method will be considered as a weak form of cooperative learning. On the whole the teachers said that the pupils (may) cooperate about half of the time during arithmetic and langage and about 63% during science.

While composing the groups, almost all teachers take into account the achievement level of the pupils, and (to a smaller degree) their preferences. Twothird of the teachers composed heterogeneous groups according to achievement level and age. Boys and girls are mostly mixed. The size of the groups varies from 2 to 8 pupils, with an average of 4. The frequency with which the composition of the groups was changed differs strongly between teachers (from each day to once a year).

To answer the third research question we used multi-level analyses. The data were gathered at different levels: the pupil level, the group level and the classroom level. In multi-level analyses the total variance of the learning progress is divided into variance components, so multi-level analysis is the most appropriate method.

First we will look at the quality of the cooperation between pupils during the performance of a standardized consensus task. The results show that most groups cooperated rather well. The mean score is 3.1 on a four-point scale. When we look at the variance components 83% of the variance is due to differences between groups and 17% of the variance is due to differences between classrooms. This means that the differences in the quality of cooperation between groups of pupils within the classroom are much larger than the differences in the mean quality of cooperation between classrooms.

Now we will have a look at the relation between organizational factors and the quality of cooperation. The teaching methods used were not related to the quality of cooperation. Effects of the group composition on the quality of the cooperation were also small. Only 6% of the variance in the quality of the cooperation can be explained by the characteristics of the pupils in the group. In table 3 the results of the multi-level analyses are presented. It seems that in groups consisting of intelligent, older pupils, mostly girls, who do not differ much in intelligence and in their perception of their schoolmates and of their own capabilities, pupils cooperated slightly better during the performance of the consensus task.

Table 3. Regression coefficients (and standard errors) of the significant characteristics of the pupils in the group

	quality of cooperation
mean intelligence	.18 (.09)
mean age	.19 (.05)
percentage girls	.20 (.05)
variance in:	
intelligence	-.18 (.08)
perception of their schoolmates	-.12 (.05)
perception of their own capabilities	-.09 (.05)

The next step is to analyse the relation between the quality of cooperation and the learning progress of the pupils. The quality of cooperation bears hardly any relation to learning progress. There was only a small relation between a high quality of cooperation and progress in arithmetic in grade 7, age eleven (correlation of .11). No relation was found between the quality of cooperation and learning progress for the other subjects/grades.

Finally we analysed the effects of organizational and instructional factors on the pupil' learning progress. The previous analyses showed that the quality of cooperation is rather high in all classrooms, so now we can look at the direct relation between these factors and the learning progress of pupils. First, the division of variance into the two variance components, the pupil level and the classroom level, are estimated (see table 4). Table 4 shows that there are hardly any differences between the participating classrooms in the mean learning progress they reached. Only 2 to 5 percent of the differences in learning progress is due to differences between classrooms. This means that no large effects of the variables on classroom level can be expected.

Table 4. Division of the variance in progress in pupil' achievement in variance components

	% variance
arithmetic	
pupil level	95%
classroom level	5%
total	100%
language	
pupil level	97%
classroom level	2%
total	99%
environmental studies	
pupil level	96%
classroom level	4%
total	100%

After modelling the organizational and instructional factors, the non-significant variables are removed one by one. In table 5 the regression coefficients of the remaining variables are given (controlled by intelligence of the pupils).
The significant variables did not give a clear view. The effects differ with respect to the three subjects and to the three grades. The only variables that have more or less stable effects in the different analyses, were:

- the time spent on the method in which pupils work individually, but in which they are allowed to ask for explanations from other pupils, has positive effects and
- frequent communication between teachers also bears relation to learning progress.

The other variables concerning the group composition and instructional factors have no stable effects on learning progress.

Conclusions

There are hardly any differences in the mean quality of cooperation and in the mean learning progress of the pupils between classrooms in which teachers use cooperative learning frequently. Therefore, no clear conclusions about which organizational and instructional factors affect the efficacy of cooperative learning can be drawn.

Because we are not satisfied with these results, we are now carrying out an in-depth study on 10 of the schools. The teachers of the 5 classrooms that achieved the highest learning progress and of the 5 schools with the lowest progress are asked to participate. In these classrooms observations will take place during 4 days. With this outlierstudy we hope to create more differences in mean achievemenst between the schools. The observations focus on:

- teaching methods and tasks,
- management and instructional capacities of the teacher,
- interactions between pupils and on-task/off-task behaviour
- behaviour of the teacher during cooperative learning

With these observations we hope to get more detailed information about the daily practice of cooperative learning in the classrooms and about the effects on interactions and on-task behaviour of pupils.